

will increase in amount and vigor due to increased amounts of sunlight reaching the forest floor. These understory species may compete with tree seedlings (either planted or natural) for nutrients and water. Timber management activities may reduce ground vegetation during attempts to establish a new tree stand

Ponderosa pine/pinegrass communities typically produce 500 to 600 pounds of forage per acre with 50 percent tree cover. As pine is replaced by fir, tree cover increases significantly; when combined pine/fir cover reaches 80 percent, forage production is reduced to 50 to 100 pounds per acre and heartleaf arnica (*Arnica cordifolia*) becomes abundant.

Natural fire, and the use of fire as a silvicultural tool, affects understory vegetation. Pinegrass and elk sedge evolved with natural fire and can withstand burning better than plants which did not. Some plants in the plant community, such as a shrub called snowbrush ceanothus, need fire to trigger germination. Because of fire control, many stands of snowbrush ceanothus have not regenerated.

Bitterbrush and certain other shrubs may be killed by fire and are not generally capable of sprouting unless soil moisture was high when an area burned. Their seeds are not stimulated by a fire's heat.

On forested areas which receive timber management treatment, the soil is disturbed during tree harvest and slash disposal. Those areas are suitable for seeding of nonnative forage species like orchard grass and intermediate wheatgrass. In harvest areas, there will be a mix of natural and introduced grasses. Grazing animals also remove vegetation which competes with regenerating tree stands. Certain range management activities like fencing and upland water developments result in improved cattle distribution and forage utilization.

Wildlife management activities vary from old-growth retention to site-specific improvement projects. Site-specific improvement projects have only short-term, localized effects on forage.

Old-growth stands currently found in wilderness, roadless areas, and visual corridors will continue a natural succession cycle until a fire or insect epidemic sets them back to an earlier, successional stage.

Wilderness visitors using pack stock also affect vegetation by trampling, damaging fragile alpine meadows, and tying stock to trees.

Vegetation resources generally do not affect mineral-related activities. Minerals development may clear away the vegetation, and trees from the claim area can be used to support development. Reclamation activities could improve forage.

Currently, 26,721 acres of the Forest are dedicated to road use. Roads provide access for timber sales, range improvement seedings, or other vegetation management activities which affect vegetation. These effects are described under each resource. Roads provide a seedbed for some noxious weeds and may contribute to their rate of spread. Road surfaces eliminate land from vegetation production.

### 3. Wildlife

The diversity of vegetation types, landforms, and plant successional stages on the Forest provides a variety of wildlife habitats. These habitats support over 365 species, including 22 fish, 9 amphibians, 14 reptiles, 235 birds, and 85 mammals (Thomas, 1979).

Some of these habitats are considered special or unique. Table III-8 (Guenther and Kucera, 1978) lists these habitats and the type of use they receive.

a. *Special Habitat*

Old-growth tree stands and their undisturbed environments, including snags and fallen trees, represent a stage in ecological succession which provides unique habitats for certain species of plants and wildlife.

Minimum levels of old growth and mature forest necessary to satisfy the NFMA requirements for viable wildlife populations have been established for the Malheur National Forest (See Appendix G). In establishing these minimum levels, it is assumed that all of the old-growth units will be occupied. More old growth in the ponderosa pine and mixed-conifer types is available than the identified minimum levels. This is not the case for old-growth lodgepole pine.

**TABLE III-8: Wildlife Use of Special and Unique Habitats on the Malheur National Forest**

Habitat	Mammals	Birds	Amphibians and Reptiles	Total
Old Growth	37	80	13	130
Riparian	52 (8)	145 (14)	17 (4)	214 (26)
Snags	21	57 (27)	16	94 (27)
Down Woody Material	39	25 (4)	7	80 (4)
Chff & Rim				
Caves & Burrows	59	6 (1)	13	78 (1)
Talus	32 (2)	17	6	55 (2)

**NOTE** Numbers in parentheses are the number of species which depend on the habitat. Numbers without parentheses are the total number of species which use the habitat, including the dependent ones.

A mountain pine beetle infestation in lodgepole pine reached epidemic proportions in the late 1970's. The unit plans approved in 1978 called for harvesting this beetle-killed lodgepole pine within 10 years. This has been accomplished on the roaded portions of the Forest. In unroaded areas, the mature stands of lodgepole pine have also been killed, and no longer provide suitable old growth. Within three decades, some stands which are now in the pole or sapling size classes will begin to reach old-growth condition. The amount of old-growth lodgepole pine will increase from the third through the fifth decades, but very little will be available in the first two decades.

Standing dead trees provide habitat for 21 mammals and 57 bird species, including 27 birds which depend on these snags for survival (e.g., woodpeckers).

Cavities in snags provide nesting, roosting, or escape habitat. Snags support nests and are used as perches. Under their loose bark, bats roost and invertebrates live and provide food for higher-order animals. Mosses, lichens, and fungi grow on their decayed wood. Snag-dependent birds and mammals often play an important role in forest insect control (Thomas 1979). Many studies of cavity-nesting, insectivorous birds show that forest insect populations may be regulated in some part by cavity-nesting bird species (Kendeigh 1947, Franz 1961, Morris et al. 1958, Morris 1963; Solomon and Morris 1971). Timber harvest and fuelwood gathering can have an adverse effect on the availability of this cavity-nesting habitat.

Dead and downed woody material has important ecological implications in terms of mineral cycling, nutrient immobilization, nitrogen fixation, fire, and wildlife habitat. Management activities that affect this resource range from debris creation by logging, to removal of woody materials by slash treatment.

b. *Unique Habitat*

Three types of unique habitats have been identified in the Blue Mountains: cliffs, talus, and caves. Although these habitats comprise a small part of the total land area, they lend diversity to an environment otherwise dominated by plant communities

Cliffs are steep, vertical, or overhanging rock faces. They are essential for survival of some raptorial birds as secure places to nest, and rear their young. Other species also require high cliffs.

Talus is the accumulation of broken rocks at the base of cliffs or other steep slopes. It is especially important for the protection of some species during reproduction and hibernation.

Caves are natural underground chambers that reach the ground's surface. They provide shelter from extreme weather conditions, darkness, solitude, stable internal environments, and physical protection from predators

Unique habitats concentrate and support a unique animal complex. Adjacent plant communities provide a food source for the animals, and snags along the tops of cliffs are essential perches for raptors. These adjacent plant communities should remain stable to provide needed cover and food. Little can be done to improve these habitats, but they can easily be destroyed.

c. *Threatened,  
Endangered, and  
Sensitive Species*

The Endangered Species Act of 1973 (as amended in 1978) requires all Federal agencies and departments to conserve "threatened and endangered species," Sensitive Species and their habitats, to aid in population recovery

Habitat is known, or expected to exist, for the American peregrine falcon and bald eagle, which are federally listed as "endangered" and "threatened," respectively. Bald eagles roost in trees along the southern edge of the forest during winter months. Consultation with the United States Fish and Wildlife was done in accordance with the Section 7 Interagency Cooperation Regulations (50CFR 402) and the Endangered Species Act of 1973, as amended. A letter for the United States Fish and Wildlife Service dated April 7, 1987, concurred with the determination of no effect on the Threatened bald eagle (*Haliaeetus leucocephalus*) and Endangered American peregrine falcon (*Falco peregrinus*). A second letter from the United States Fish and Wildlife Service, dated August 10, 1987, stated that habitat for the American peregrine falcon may exist in the Strawberry Mountain Wilderness Area, but the birds did not occur on the Forest. A letter from the United States Department of Interior, Office of Environmental Project Review, dated November 23, 1987, stated there are no Endangered or Threatened fish on the Malheur National Forest and directed attention at two category 2 candidate fish species, redband trout (*Oncorhynchus spp.*) and the Malheur mottled sculpin (*Cottus bairdi ssp.*)

There is potential nesting habitat and seasonal migratory use of the Forest by American peregrine falcon. These birds are recorded each spring and fall as a migrant species. There are no known nests on the Forest, but two areas within the Strawberry Mountain Wilderness have been identified as potential nesting habitat. The Pacific Coast Recovery Plan for the American peregrine falcon (1982) assigned a goal of one breeding pair to the Malheur National Forest.

Bald eagles use roosts on the southern edge of the Forest during the winter months. Approximately 4,040 forested acres containing 2 known, and 13 potential, winter roosts have been identified on the Burns Ranger District. All roosts are in mature stands of ponderosa pine along streams. Active roost sites are managed jointly with the Bureau of Land Management.

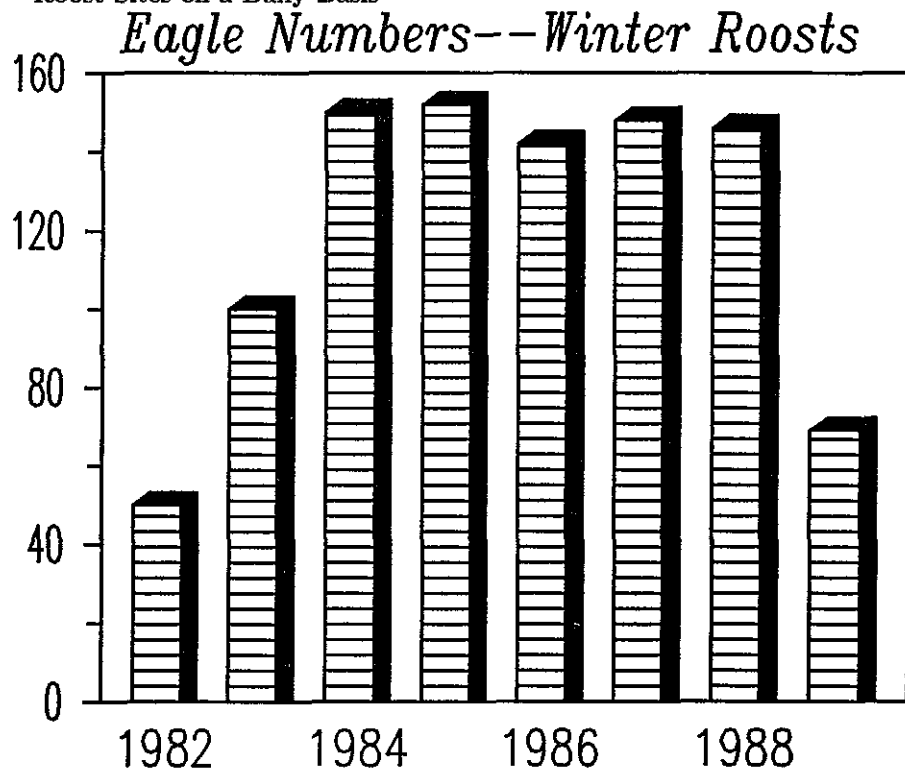
In addition to winter roosts, bald eagles use most river drainages for movement during winter months. Figure III-11 summarizes peak bald eagle numbers observed during

one morning's flight from active winter roosts. These peaks correspond to maximum waterfowl occurrence, which is the eagle's prey, in the Harney Basin.

Direction for management of bald eagles is provided by the United States Fish and Wildlife Service's "Recovery Plan for the Pacific Bald Eagle" (1986). The plan assigned three "targets" to the John Day River and the Malheur River, both of which have their headwaters on the Forest. The North Fork of the Malheur River and the Malheur River may contain potential bald eagle nesting habitat.

There are three fish species which are known to occur on the Forest, or expected to occur there, that are included on the Regional Forester's sensitive species list of July 22, 1987. These three species are also listed in the 1985 Federal Register Notice of Review as "category 2 species," which are those that "need further information to confirm the appropriateness of proposing the taxon to the list of Endangered or Threatened species." These species are the redband trout (*Oncorhynchus spp.*), the bull trout (*Salvelinus confluentus*), and the Malheur mottled sculpin (*Cottus bairdi spp.*)

FIGURE III-11: Peak Numbers of Bald Eagles Observed Using Active Winter Roost Sites on a Daily Basis



NOTE: In 1989, eagles stayed closer to the Malheur National Wildlife Refuge, feeding on dead carp resulting from a cold winter.

The taxonomy of the redband trout and inland populations of rainbow trout is not established. It seems apparent from a management standpoint that these fish are adapted to warmer water temperatures than coastal rainbow trout. Since rainbow trout occur throughout the Forest, the current philosophy is to establish management standards using their habitat needs because they would be more constraining than standards based on redband trout, which has a higher temperature tolerance.

Populations and habitat conditions will be monitored for rainbow and redband trout. When taxonomic and habitat differences are resolved, it may be necessary to revise some Forest Plan standards.

The bull trout is known to occur in some headwater streams of the Malheur and John Day River Systems. It is proposed as a management indicator species for monitoring riparian and fish habitat conditions in those streams.

The Malheur mottled sculpin probably occurs in only a few scattered streams in the Harney Basin. The headwaters of many streams in the Harney Basin are on the Forest. An identified information need is a survey of these streams to determine the distribution and habitat characteristics of this species, so that a monitoring plan for the species can be prepared. Modifications of Forest Plan standards to protect this species may be appropriate at that time.

Sensitive animal species known to occur on the Malheur National Forest are listed in Table III-9. Similarly, sensitive plant species are listed in Table III-10.

**TABLE III-9: Threatened, Endangered and Sensitive Animals and their Habitat**

Scientific Name	Common Name	Habitat
<i>Oncorhynchus spp.</i>	redband trout	warm-cool streams
<i>Salvelinus confluentus</i>	bull trout	cool-water streams
<i>Cottus bairdi ssp</i>	Malheur mottled sculpin	Harney Basin
<i>Rana pretiosa</i>	western spotted frog	rivers and valleys
<i>Gavia immer</i>	common loon	large water, migration
<i>Buteo swainsoni</i>	Swainson's hawk	sagebrush-juniper
<i>Haliaeetus leucocephalus</i>	bald eagle	south forest edge-pine
<i>Falco peregrinus anatum</i>	American peregrine falcon	cliffs
<i>Centrocercus urophasianus</i>	western sage grouse	sagebrush-juniper
<i>Grus canadensis tabida</i>	greater sandhill crane	meadows, wetlands
<i>Numenius americanus</i>	long-billed curlew	sage-grass, wetlands
<i>Bartramia longicauda</i>	upland sandpiper	meadows
<i>Sorex preblei</i>	preble's shrew	forests, meadows
<i>Plecotus townsendii</i>	Townsend's western big-eared bat	low elevations, caves, buildings
<i>Gulo gulo luteus</i>	California wolverine	high elevations
<i>Ovis canadensis californiana</i>	California bighorn	cliffs, talus, high elevations

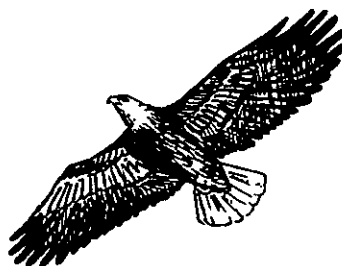


TABLE III-10 Sensitive Plant Species and General Habitat

Scientific Name	Candidate*	Habitat
<i>Alhuc brandegei</i>	no	gravelly meadows
<i>Alhuc campanulatum</i>	no	dry soils at medium, high elevation
<i>Alhuc tolmei</i> var. <i>platphyllum</i>	no	Rocky or clayey soils, sparse cover
<i>Astragalus atratus</i> var. <i>owyheensis</i>	no	grassland-sagebrush
<i>Astragalus diaphanus</i> var. <i>diaphanus</i>	yes	riverbanks, gravel bars, alluvial
<i>Astragalus diaphanus</i> var. <i>diurnus</i>	no	lower John Day Valley
<i>Astragalus tegetarioides</i>	yes	ponderosa pine, juniper
<i>Bupleurum americanum</i>	no	rock outcrops, meadows, grasslands
<i>Cymopterus bipinnatus</i>	no	cliffs, talus and rocky slopes
<i>Dryopteris filix-mas</i>	no	mesic forest, streambanks
<i>Geum rossii</i> var. <i>turbidatum</i>	no	subalpine areas
<i>Lomatium oregonum</i>	yes	high-elevation, rocky areas, talus
<i>Luna serpentina</i>	yes	serpentine soil, pine-juniper (Grant County)
<i>Lupinus biddlei</i>	yes	sagebrush, Harney and Malheur Co
<i>Lupinus cusickii</i>	yes	grass-sagebrush
<i>Lycopodium annotinum</i>	no	mesic forest, rocky-timberline
<i>Mimulus washingtonensis</i>	no	wet, open places, low elevation
<i>Penstemon eriantherus</i> var. <i>argillosus</i>	no	dry, open places, low elevation
<i>Penstemon spatulatus</i>	yes	high elevation, cliff, rocky slopes
<i>Pleuropogon oregonus</i>	yes	wetlands, Union and Lake Co
<i>Polystichum lemmonii</i>	no	open, rocky-timberline, serpentine
<i>Ranunculus oresterus</i>	no	valleys and lower meadows
<i>Silene scaposa</i> var. <i>scaposa</i>	yes	ponderosa pine-juniper-sagebrush
<i>Thelypodium eucosmum</i>	yes	ponderosa pine-juniper, lower areas

\* Federal candidate species for listing as Threatened or Endangered, 1985 Notice of Review. Other species ("no") are listed as rare, threatened or endangered in the Oregon Natural Heritage data base.

#### d Big-Game Habitat

The most abundant and popular big-game species occurring on the Forest include mule deer and Rocky Mountain elk. Public use of the Forest is significantly higher during the big-game hunting seasons. Traditionally, management of big-game herds has been the responsibility of the State of Oregon, Department of Fish and Wildlife (ODF&W), with the habitat managed by the USDA Forest Service. Now that the Forest Service has definite responsibilities for wildlife items like identification of indicator species, a close partnership between ODF&W and the Forest Service is crucial. These agencies cooperate closely. The Malheur National Forest lies within 7 ODF&W Game Management Units (GMUs) and accounts for 19 percent of the total land in those units (see Table III-11).

Mule deer populations have fluctuated during the past 40 years and currently are in a downward trend in two of the seven GMUs associated with the Forest. Prior to 1970, elk populations were low but relatively stable. Since then, populations have steadily increased to a current summer population of about 6,600 elk (Greg Hattan, ODF&W, personal communication, August 1986). There are approximately 2,865 elk wintering on the Malheur National Forest. Current annual Rocky Mountain elk harvest is estimated to be about 2,000 animals. The demand for elk, and the number of elk hunters, is expected to continue increasing.

**TABLE III-11: Total area of Oregon Department of Fish and Wildlife Game Management Units (GMU), and Percent of GMU area on the Malheur National Forest (MNF)**

Game Management Unit	Total Area (Acres)	Percent On MNF	Total Area On MNF (Ac.)
Desolation	455,860	16%	74,299
Northside	697,600	34%	234,335
Murderers Creek	734,080	58%	425,365
Silvies	1,151,360	15%	178,522
Malheur River	1,799,680	16%	287,322
Beulah	1,748,480	13%	234,532
Sumpter	969,600	3%	25,037
<b>TOTAL</b>	<b>7,556,660</b>	<b>19%</b>	<b>1,459,422</b>

Mule deer are an important big-game species on the Malheur National Forest, but are not included as an indicator species because it is assumed that habitat requirements for elk are more restrictive and that elk management will also achieve mule deer objectives. It is recognized that mule deer use different forage and somewhat different winter ranges, and do not require as much cover as elk. These differences in habitat preferences are assumed to be insignificant.

Summer elk habitat is the predominant component of the Forest acreage scheduled for timber harvest. Big-game habitat and timber management are interrelated. Habitat quality for big-game animals is determined by cover, summer forage, and road density (disturbance) factors. Cover is provided by timber stands that meet size, spacing, and quality requirements for elk. Thermal cover is available when stands have certain ranges of tree height and canopy closures. It is a very important component of the summer range for elk. Forage is provided in natural openings, open timber stands, and recently regenerated timber stands.

**e Big Game Range**

Big-game winter range on the Forest has been identified for elk but not for mule deer. The assumption is that management of elk winter range will provide for the needs of mule deer. A total of approximately 300,000 acres of elk winter range was identified on the Forest in cooperation with ODF&W. There are 14 separate winter range areas varying in size from 6,000 to 96,000 acres. In addition to these areas, a significant portion of the winter range is on private lands.

Calculating a Habitat Effectiveness Index (HEI) for elk on the Malheur National Forest (Thomas et al. 1988) suggests that the overall forest-wide HEI condition is 0.51, which results from total cover of 56 percent (13 percent satisfactory and 43 percent marginal). Habitat effectiveness is less than this on some winter ranges. Most winter range has more than enough grass and grass-like forage to support the present number of livestock and wintering elk, but browse is heavily used by deer, elk and livestock. Elk herds on the Forest have been increasing. Forage to carry larger wintering elk herds may not be available after livestock use on certain winter ranges. Monitoring winter ranges to determine forage quality and quantity for big-game will be necessary.

**f Other Big Game**

Pronghorn populations occur in Bear Valley, Murderers Creek, and throughout the southern part of the Forest, utilizing areas where juniper-bunchgrass-sagebrush habitat adjoins ponderosa pine forests. Pronghorn have had an increasing population, with current estimates ranging from 200 to 250 animals.

California bighorn sheep were introduced in the Strawberry Mountain Wilderness in 1971, when 21 animals were released. After an initial increase, the population has dwindled to less than 10 animals because of rugged terrain and a lack of adequate winter range. A second transplant occurred near Aldrich Mountain in 1978 when 14 animals were initially released. In 1982, 4 additional sheep were added to the Aldrich herd. Excellent summer range and adequate quality winter range have contributed to a current estimated population of 85 sheep for Aldrich. A third bighorn release was made in early 1988 when 15 sheep were introduced in the McClellan Mountain Roadless Area.

Other game species known to occur on the Forest are the black bear and mountain lion. The white-tailed deer has been documented as occurring on the Forest, but it is considered rare.

*g Management Indicator Species*

Since the Forest provides habitat for over 365 wildlife species, each with varying habitat needs, it is not possible to monitor the impacts of habitat management on every species. Therefore, management indicator species (MIS) have been selected to monitor the effects of management activities. Table III-12 provides a list of management indicator species, and the habitat requirements of management indicator species are further described in Appendix G.

Eleven species (all woodpeckers) were selected as indicators for dead and defective tree habitat because they are primary cavity excavators, that is, they create their own nesting holes in dead and defective trees. The holes which they create are in turn used by over 30 other species. By providing habitat for these woodpeckers, we are also providing habitat for the other cavity-dependent species.

*h Future Projections*

Projected demands for wildlife-related recreational use, both consumptive and non-consumptive, are expected to increase in the next decade. Nonconsumptive use is expected to increase approximately 20 percent, while consumptive use is expected to increase 17 percent or more (State of Oregon, 1983). This growth trend is expected to influence demand for Rocky Mountain elk more than demand for mule deer. Big-game herds are projected to increase under current Forest management. Present elk populations are close to Oregon Department of Fish and Wildlife objectives and these population objectives are expected to be maintained.



TABLE III-12: Management Indicator Species

Species	Reason for Selection and/or Habitat
Rocky Mountain elk	species commonly hunted
pileated woodpecker	old growth
pine marten	old growth
three-toed woodpecker	old growth
Lewis' woodpecker	primary cavity excavator; dead & defective habitat
yellow-bellied sapsucker	primary cavity excavator; dead & defective habitat
red-breasted sapsucker	primary cavity excavator; dead & defective habitat
Williamson's sapsucker	primary cavity excavator; dead & defective habitat
downy woodpecker	primary cavity excavator; dead & defective habitat
hairy woodpecker	primary cavity excavator; dead & defective habitat
white-headed woodpecker	primary cavity excavator; dead & defective habitat
three-toed woodpecker	primary cavity excavator; dead & defective habitat
black-backed woodpecker	primary cavity excavator; dead & defective habitat
northern flicker	primary cavity excavator; dead & defective habitat
pileated woodpecker	primary cavity excavator; dead & defective habitat
steelhead	anadromous riparian
bull trout	non-anadromous riparian
cutthroat trout	non-anadromous riparian
rainbow/redband trout	non-anadromous riparian

The need for continued cooperation with the Oregon Department of Fish and Wildlife to provide adequate wildlife habitat, and obtain joint population and habitat inventories, will increase, especially for balancing herd sizes with utilization standards.

*i. Relationship Between Forest Management and Wildlife*

Forest management affects the structure, size, shape and juxtaposition of plant communities, which in turn affects animal species richness and population numbers. Increasing the amount of edge when designing harvest units generally increases plant and animal diversity. Timber harvest with deliberately spaced and distributed clearcuts or shelterwood cuts will benefit species which respond positively to increased edge habitat and early successional stages. Species which depend more on vertical habitat diversity instead of horizontal diversity will benefit by habitat available in unmanaged and uneven-aged stands.

Loss of dead and down material, cull trees, and snags for firewood, cogeneration fuel, or slash treatment reduces habitat for cavity-nesting species and animals which require dead and down material for nesting and feeding.

Harvesting mature or old-growth timber would affect species which depend on older successional stages for breeding and feeding habitat. Conversely, retaining dedicated mature/old-growth areas will continue to provide habitat for those wildlife species.

The principal range improvement activities which affect big-game habitat are upland water development, fencing, and range forage seedings. These activities, designed to provide better distribution of livestock, also increase the quality and quantity of forage available for big-game herds. Salting is also used to improve livestock distribution, and big-game animals will use the salt sources too. Conversion of sagebrush to grass provides short-term benefits by increasing forage for elk. Such changes may decrease mule deer habitat.

Structural range improvements like fences can interfere with big-game movements and travel routes. Fences on the Forest are built to a standard which allows big game to go

under the bottom wire. Range water developments benefit wildlife by providing water where none existed before (as in guzzler improvements) or by making the water more accessible (troughs and ponds). Stock tanks can be a trap for small animals, so escape ramps are provided.

The existence and production of wildlife is directly related to habitat quality and quantity. Habitat improvement projects are designed to either maintain or increase the dispersal or populations of a given species. The Forest has the potential to improve habitat conditions for a wide variety of wildlife species. But an improvement project for one species may be a detriment to another.

Developed and dispersed recreation facilities may adversely affect wildlife, fisheries, or sensitive plants when located in riparian areas, big-game winter ranges, or in habitats used by threatened, endangered or sensitive species. The facilities and their use by people discourage use of these areas by many wildlife species. Location of recreation sites in areas favored by wildlife, such as riparian zones, can increase the impact on wildlife species. Habitat losses from facility development include loss of ground cover, snag trees, downed, woody material, and burrowing animal habitat due to compaction and human disturbance.

Each year on the Forest, recreational hunting results in the harvest of deer, elk, bear, cougar, and grouse. Harvest levels are managed by the Oregon Department of Fish and Wildlife.

The management of scenery is often compatible with wildlife management goals. Vegetation diversity promotes visual variety and produces forage for wildlife. Riparian areas, cliffs, rims, caves and talus slopes, snags, large, old trees, and openings are often visually attractive and they also provide a home for wildlife.

Wilderness designation protects existing wildlife habitats from human modification and leaves them vulnerable to natural modification. The wilderness areas provide spring, summer, and fall habitat for mule deer and Rocky Mountain elk. During big-game hunting seasons, the wildernesses provide escape areas for bucks and bulls. Bear, coyote, and cougar also inhabit the areas. Pileated woodpecker, pine marten, and other species which utilize old growth also occur in the areas.

Minerals exploration and development often interfere with wildlife use patterns. Migration, mating, and parturition habits may be disturbed. Mining-related road construction and development result in at least temporary loss of habitat for some species. Development of rock quarries is particularly threatening to wildlife which depend on talus slopes and cliffs. Conversely, abandoned mine shafts do provide some of the habitat needs of cave-dwelling species.

Increasing tree cover as a result of fire suppression has changed ground vegetation. Pinegrass and elk sedge, two common native plants, decrease with increasing fir-tree cover. On the other hand, low-intensity fires may have a detrimental effect on bitterbrush and sagebrush, key winter forage species.

#### 4 Fisheries

The Malheur National Forest contains a highly diversified fishery resource ranging from coldwater-dependent cutthroat and bull trouts to cool-water smallmouth bass. In addition, the John Day River drainage supports anadromous runs of Columbia River spring Chinook salmon and summer steelhead trout. Fisheries habitat ranges from cold, high-elevation headwater streams and lakes to extreme low-flow or intermittent streams in which summer daily maximum water temperatures exceed 80° Fahrenheit.

The Forest encompasses parts of the following major drainages.